

CLAIMS

1. A brightness adjustment arrangement for adjusting brightness of an image signal having digital pixel values to produce brightness adjusted output pixel values, comprising:

5 an adder that adds a brightness value to the digital pixel values of the image signal to produce adjusted pixel values and a carry-out signal;

10 a lower clamp circuit that receives the carry-out signal and at least one bit of the brightness value and clamps the adjusted pixel values to a lowest output pixel value when the carry-out signal and the at least one bit of the brightness value indicate that addition of the brightness value to the digital pixel values produces adjusted pixel values below the lowest output pixel value; and

15 an upper clamp circuit that receives the carry-out signal and the at least one bit of the brightness value and clamps the adjusted pixel values to a highest output pixel value when the carry-out signal and the at least one bit of the brightness value indicate that addition of the brightness value to the digital pixel values produces adjusted pixel values above the highest output pixel value.

2. The arrangement of Claim 1, wherein the digital pixel values represent luminance values of pixels of the image signal.

3. The arrangement of Claim 2, wherein the brightness value is in two's complement format, with a most significant bit representing a sign of the brightness value.

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4. The arrangement of Claim 3, wherein the most significant bit of the brightness value is the at least one bit of the brightness value.

5. The arrangement of Claim 4, wherein the upper and lower clamp circuits include an overflow determination circuit that determines whether the adder has overflowed.

6. The arrangement of Claim 5, wherein the upper and lower clamp circuits further include an exclusive-OR gate responsive to the carry-out signal and the most significant bit of the brightness value to determine a sign of an overflow of the adder.

7. The arrangement of Claim 6, wherein the adder is a seven-bit full adder that adds the seven most significant bits of the luminance values to the seven least significant bits of the brightness values, with the results of the addition concatenated with the least significant bit of the luminance values to produce the adjusted pixel values.

8. The arrangement of Claim 7, wherein the luminance values have a range of 0 to 255, with the lowest output pixel value equal to 0 and the highest output pixel value equal to 255.

9. A motion video architecture data path for providing a motion picture window within a display, comprising:

a formatter that formats supplied image data into a format containing a luminance value for pixels within the image data;

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a brightness adjuster that adds a brightness value to the luminance value of pixels to produce brightness adjusted pixels of the image data; and

10 a color space converter that converts the format of the brightness adjusted pixels to a format renderable by a display device.

10. The motion video architecture data path of Claim 9, wherein the brightness adjuster includes:

5 an adder that adds the brightness value to the luminance values of the pixels to produce the brightness adjusted pixels and a carry-out signal;

10 a lower clamp circuit that receives the carry-out signal and at least one bit of the brightness value and clamps any brightness adjusted pixel to a lowest output pixel value when the carry-out signal and the at least one bit of the brightness value indicate that addition of the brightness value to the luminance values of that pixel produces a brightness adjusted pixel value below the lowest output pixel value; and

15 an upper clamp circuit that receives the carry-out signal and at least one bit of the brightness value and clamps any brightness adjusted pixel to a highest output pixel value when the carry-out signal and the at least one bit of the brightness value indicate that addition of the brightness value to the luminance values of that pixel produces a brightness adjusted pixel value above the highest output pixel value.

20 11. The motion video architecture data path of Claim 10, further comprising control logic coupled to the brightness adjuster and containing a programmable brightness value that is supplied to the adder.

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12. A graphics controller that receives image data from a video memory and controls display of images on a display, the graphics controller comprising:

5 a video controller that produces a graphic presentation;

a computer graphics controller that controls graphics operations;

10 a sequencer coupled to the video controller and the computer graphics controller to control timing of the video controller and the computer graphics controller; and

15 a motion video architecture data path that receives the image data from the video memory and incorporates motion video into the graphic presentation produced by the video controller, the motion video architecture data path including a brightness adjuster that adds a brightness value to the value of pixels of the image data received from the video memory to produce brightness adjusted pixels of the image data received from the video memory.

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13. The graphics controller of Claim 12, wherein the brightness adjuster includes:

5 an adder that adds the brightness value to the value of pixels to produce the brightness adjusted pixels and a carry-out signal;

10 a lower clamp circuit that receives the carry-out signal and at least one bit of the brightness value and clamps any brightness adjusted pixel to a lowest output pixel value when the carry-out signal and the at least one bit of the brightness value indicate that addition of the brightness value to the value of that pixel produces a brightness adjusted pixel value below the lowest output pixel value; and

15 an upper clamp circuit that receives the carry-out signal and at least one bit of the brightness value and

20 clamps any brightness adjusted pixel to a highest output pixel value when the carry-out signal and the at least one bit of the brightness value indicate that addition of the brightness value to the value of that pixel produces a brightness adjusted pixel value above the highest output pixel value.

5 14. The graphics controller of Claim 13, further comprising a multiplexer that receives the graphic presentation from the video controller and the brightness adjusted pixels from the motion video architecture data path and is responsive to a control signal to pass either the graphic presentation or the brightness adjusted pixels to a display.

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5 15. A system comprising:
a display that receives image data and produces a visible image display;
a video memory that stores the image data;
a computer that provides the image data to the video memory; and
10 a graphics controller that retrieves the image data stored in the video memory and supplies the image data to the display, the graphics controller including a brightness adjuster that adds a brightness value to the values of pixels of the image data received from the video memory to produce brightness adjusted pixels of the image data received from the video memory.

5 16. The system of Claim 15, wherein the brightness adjuster includes:
an adder that adds the brightness value to the value of a pixel to produce the brightness adjusted pixels and a carry-out signal;
a lower clamp circuit that receives the carry-out signal and at least one bit of the brightness value and

clamps any brightness adjusted pixel to a lowest output pixel value when the carry-out signal and the at least one bit of the brightness value indicate that addition of the brightness value to the value of that pixel produces a brightness adjusted pixel value below the lowest output pixel value; and

an upper clamp circuit that receives the carry-out signal and at least one bit of the brightness value and clamps any brightness adjusted pixel to a highest output pixel value when the carry-out signal and the at least one bit of the brightness value indicate that addition of the brightness value to the value of that pixel produces a brightness adjusted pixel value above the highest output pixel value.

17. The system of Claim 15, wherein the display is a liquid crystal display (LCD).

18. The system of Claim 16, wherein the graphics controller further includes a formatter that formats the supplied image data into a YUV format containing a luminance value for each pixel within the image data, and a color space converter that converts the format of the brightness adjusted pixels to RGB format compatible for rendering by the display.

19. A method of adjusting a brightness response of a display, comprising:

adding a brightness value to values of pixels in an image to be displayed to produce brightness adjusted pixels;

clamping values of any of the brightness adjusted pixels that fall below a lowest output pixel value to the lowest output pixel value, and values of any of the brightness adjusted pixels that are above a highest output pixel value to the highest output pixel value; and

providing the brightness adjusted pixels to the display.

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20. The method of Claim 19, wherein the step of adding includes adding in an adder the brightness value to the value of each pixel in the image to produce the brightness adjusted pixels and a carry-out signal.

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21. The method of Claim 20, wherein the step of clamping includes the steps of receiving in a lower clamp circuit the carry-out signal and at least one bit of the brightness value and clamping any brightness adjusted pixel to a lowest output pixel value when the carry-out signal and the at least one bit of the brightness value indicate that addition of the brightness value to the value of that pixel produces a brightness adjusted pixel value below the lowest output pixel value; and

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10 receiving in an upper clamp circuit the carry-out signal and at least one bit of the brightness value and clamping any brightness adjusted pixel to a highest output pixel value when the carry-out signal and the at least one bit of the brightness value indicate that
15 addition of the brightness value to the value of that pixel produces a brightness adjusted pixel value above the highest output pixel value.

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22. The method of Claim 19, wherein the image data is in a YUV format, and the values of the pixels to which the brightness values are added are luminance values.

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23. The method of Claim 22, wherein the step of providing includes converting the image data with the brightness adjusted pixels to RGB format.

~~23~~ 24. A brightness adjustment arrangement for adjusting brightness of an input image signal having digital pixel values to produce brightness adjusted output pixel values within a desired range of values, comprising:

an adder that adds a user-definable signed brightness value to the digital pixel values of the image signal to produce adjusted pixel values and a carry-out signal; and

a clamp circuit that clamps the adjusted pixel values to within said desired range of values.

~~24~~ ²³ 25. The arrangement of Claim ~~24~~ ²³, wherein the clamp circuit includes a lower clamp circuit that receives the carry-out signal and at least one bit of the brightness value and clamps the adjusted pixel values to a lowest output pixel value when the carry-out signal and the at least one bit of the brightness value indicate that addition of the brightness value to the digital pixel values produces adjusted pixel values below the lowest output pixel value; and

an upper clamp circuit that receives the carry-out signal and the at least one bit of the brightness value and clamps the adjusted pixel values to a highest output pixel value when the carry-out signals and the at least one bit of the brightness value indicate that addition of the brightness value to the digital pixel values produces adjusted pixel values above the highest output pixel value.

~~25~~ ²⁴ 26. The arrangement of Claim ~~25~~ ²⁴, wherein the range is 0 to 255.